



September 11, 2023

Follow-up Limited Legionella Assessment Report

**Mission Valley State Building
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Executive Summary

Forensic Analytical Consulting Services (FACS) was retained by the California Department of General Services (DGS) to provide environmental health services regarding a limited *Legionella* assessment of the potable water system serving the Mission Valley State Building located at 7575 Metropolitan Dr., San Diego, California, including the California Department of Industrial Relations (DIR) leased space at the building. The assessment was performed as part of a due diligence investigation with respect to *Legionella* bacteria in response to a reported confirmed legionellosis case for one occupant. FACS performed the initial assessment on April 17 & 18, 2023, which included a visual assessment of selected components of the potable water system, collection of water samples for *Legionella* at representative site fixtures, and collection of supporting water chemistry data. Following implementation of hyperchlorination of the domestic hot water (DHW) and domestic cold water (DCW) systems in the building by a third-party water treatment contractor, follow-up assessments were performed by FACS on May 3, June 6, July 6, and August 10, 2023, to evaluate the efficacy of remediation efforts.

The current status of the water systems in the building following the August 10, 2023, sampling and whether corrective actions are recommended, as well as a summary of the assessment findings and corresponding recommendations, are provided in the tables below:

Table 1: Water System Assessment & Sampling Findings Summary

Water System Assessment & Sampling Findings Summary 8/10/23		Corrective Action (✓)
1.0	Building Public Water Supply (Municipal Supply)	
-	<i>Legionella</i> was not detected in the sample collected from the municipal water.	\
-	The disinfectant level in the municipal water entering the building was above the recommended level and temperature was below the recommended maximum.	\
-	<i>Legionella</i> contamination is not suspected in the public water supply at the time of sampling. However, <i>Legionella</i> and other pathogens are known to be endemic to water and present in public water supplies at low levels. Conditions supportive of amplification were not observed at the backflow preventer at the time of the assessment, though temperature and disinfectant levels can fluctuate seasonally.	\
2.0	Domestic Hot & Cold Water System Distribution	
-	Results of previous follow-up sampling indicated that hyperchlorination was effective at initially reducing <i>Legionella</i> contamination in the domestic hot water (DHW) and domestic cold water (DCW) systems and distribution piping, however the July and August assessments found some post-flush DHW and DCW samples with <i>Legionella</i> concentrations above recommended action levels. Samples collected from fixtures with filters in place were non-detect for <i>Legionella</i> , indicating that filters continue to be effective in controlling potential exposure.	✓
-	Residual disinfectant levels measured within the circulating DCW system were generally found to be within target ranges for disinfection of <i>Legionella</i> , while all but two of the DHW locations sampled were below the target range. Temperatures within both the DCW and DHW systems were found to be outside of the ideal growth range for <i>Legionella</i> , with the exception of the measurement collected at the rooftop expansion tank. Insulation was observed at most accessible areas of DCW and DHW pipework, however some rooftop pipework in the mechanical area lacks insulation.	✓
-	Sampling results indicate that filters are effective in controlling potential exposure to <i>Legionella</i> in the central water systems. Due to the continued presence of detectable <i>Legionella</i> concentrations in (unfiltered) pre and post-flush sampling, the number of locations where <i>Legionella</i> was detected, and the increases in concentration of <i>Legionella</i> in samples over time, amplification in the DHW and DCW is suspected. See section 4.0 below for specific findings related to the rooftop mechanical area components.	✓

Water System Assessment & Sampling Findings Summary 8/10/23		Corrective Action (✓)
3.0	Water System Point of Use (POU) Fixtures	
-	Manual faucets located in the janitor closet sinks are fitted with point-of-use filters. All breakroom sink fixtures are fitted with in-line filters. Additionally, drinking fountains and restroom fixtures have been cleaned and disinfected and/or replaced previously. Samples collected from the break room sinks, as well as all of restroom sinks and showers with filters in place, were non-detect for <i>Legionella</i> . However, detectable <i>Legionella</i> was found in the three (unfiltered) pre-flush samples collected before filtration.	✓
-	Temperatures at the fixtures were generally found to stabilize quickly, within 30-60 seconds, with the exception of the sink fixture in the 3 West Women's Restroom adjacent to J-32, which took approximately 90 seconds to stabilize, suggesting that usage of the DHW at this fixture may be low.	✓
-	The presence of detectable bacteria in all of the unfiltered pre-flush samples collected suggests localized <i>Legionella</i> amplification at some fixtures, however, the absence of detectable results in the samples collected from fixtures with filters in place indicates that the filters are effective in preventing exposure to <i>Legionella</i> bacteria.	✓
4.0	Water System Processing Components	
-	Results of follow-up sampling collected at the rooftop DHW Storage Tank were non-detect for <i>Legionella</i> . Previous sampling of the rooftop expansion tank indicated localized <i>Legionella</i> contamination. The sample collected in August from the expansion tank found <i>Legionella</i> concentrations above recommended levels.	✓
-	Temperature measurements in the DCW from the expansion tank were found to be within the growth range for <i>Legionella</i> , with residual disinfectant measuring just below the recommended minimum. Similarly, disinfectant levels collected at the DHW Storage Tank were also below the recommended minimum for control of <i>Legionella</i> . However, the measured temperature at the DHW Storage Tank was 130°F, outside of the growth range for <i>Legionella</i> .	✓
-	<i>Legionella</i> amplification is not suspected within the DHW Storage Tank. However, heavy discoloration was observed at the water while flushing the drain line, suggesting that blowdown frequency may not be adequate for controlling accumulation of sediment and scale/corrosion (rust). Disinfectant residuals are expected to diminish when water is stored at high temperatures, maintaining the current set points of the DHW boiler is adequate for control of <i>Legionella</i> , as evidenced by the sampling results. Localized <i>Legionella</i> contamination is suspected at the expansion tank. The expansion tank does not represent a risk for occupant exposure, as there is no exposure point where water is accessible, there is a potential for <i>Legionella</i> contamination of downstream systems.	✓
END		

Table 2: Water System Assessment & Sampling Recommendations Summary

Water System Assessment & Sampling Recommendations 8/10/23		Completed (✓)
\	General Recommendations	
-	Review all previous recommendations from the initial assessment (April 17 & 18 2023) and each of the follow-up assessments (May 3, June 6, July 6 & 7 and August 10, 2023) and document completed actions in the site WMP Corrective Action Log.	<input type="checkbox"/>
-	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address the identified localized contamination at fixtures represented by the sample results. This action plan should include a daily flushing program. Consider hyperdisinfection to address potential re-amplification of <i>Legionella</i> in the centralized DHW and DCW water systems serving the building.	<input type="checkbox"/>
2.0	Domestic Hot & Cold Water System Distribution	
-	Consider remediation of the domestic hot and cold water systems as part of the corrective action plan. Consult with a qualified water treatment contractor regarding the most appropriate methods, however chemical treatment (e.g., with a chemical oxidant) is often referenced as an effective method for short-term remediation.	<input type="checkbox"/>
3.0	Water System Point of Use (POU) Fixtures	
-	Following implementation of recommended corrective actions, conduct follow-up sampling of previous positive locations, representative near and distal fixtures and system components.	<input type="checkbox"/>
-	Evaluate the configuration and usage of the sink faucets in the 3 West Women's Restroom adjacent to J-32. Conduct regular flushing where areas of low-use or low flow are identified. Document actions and store with the site WMP documentation for review at the next WMT meeting.	<input type="checkbox"/>
-	Continue to implement point-of-use and in-line filtration at all building fixtures until further validation sampling demonstrates that the <i>Legionella</i> amplification is controlled in building water systems.	<input type="checkbox"/>
4.0	Water System Processing Components	
-	Ensure that the DHWST is supplying water consistently stored at a temperature that ensures delivery temperatures as close to 120°F as possible.	<input type="checkbox"/>
-	Evaluate the configuration of the roof top DCW expansion tank and its proximity to the nearby domestic hot water return line to assess the potential for conductive heat gain. Consult with a building engineer, as needed.	<input type="checkbox"/>
END		

Introduction

Forensic Analytical Consulting Services (FACS) was retained by the California Department of General Services (DGS) to provide environmental health services regarding a limited Legionella assessment of the potable water system serving the Mission Valley State Building located at 7575 Metropolitan Dr., San Diego, California, including the California Department of Industrial Relations (DIR) leased space at the building. The assessment was performed as part of a due diligence investigation with respect to *Legionella* bacteria in response to a reported confirmed legionellosis case for one occupant. FACS performed the initial assessment on April 17 & 18, 2023, which included a visual assessment of selected components of the potable water system, collection of water samples for Legionella at representative site fixtures, and collection of supporting water chemistry data. Following implementation of hyperchlorination of the domestic hot water (DHW) and domestic cold water (DWC) systems in the building by a third-party water treatment contractor, follow-up assessments were performed by FACS on May 3, June 6, July 6, and August 10, 2023, to evaluate the efficacy of remediation efforts.

The purpose of the initial and follow-up assessments was to 1) perform a due diligence investigation and assess the water system and related components for potential sources of *Legionella* amplification; 2) make recommendations for corrective action, as necessary; and 3) provide information for consideration in assessing risk to building occupants.

Background

Legionella

Legionella bacteria are waterborne pathogens that may naturally be present, albeit typically in low concentrations, in various water system types including surface, ground, potable, and other water systems or reservoirs. While naturally occurring in the environment, *Legionella* bacteria can become a concern for public health when amplification, or growth, of the bacteria occurs in a water system, which results in subsequent human exposure. Exposure to *Legionella* bacteria can result in illness, specifically Legionnaires' Disease, Pontiac Fever, or extrapulmonary legionellosis. Immunocompromised individuals are more susceptible to developing *Legionella*-related illness following exposure to *Legionella*.

Available guidance documents have recognized several conditions that favor amplification of *Legionella* bacteria in water systems. In general, these conditions include:

- Lack of flow or water stagnation either by design (e.g., cap) or lack of use (e.g., unused fixture).
- Improper water chemistry, including low or no residual oxidant or available water treatment.
- Temperature within the growth range of the bacteria.
- The presence of pressure balancing fluctuations, backflow problems or cross-connection between water systems with different uses/purposes.
- The presence of scale, debris, algae, or other commensurate organisms in the water system or equipment served by the system.

To prevent potential exposure to *Legionella* bacteria, it is important to identify and control the source(s) of *Legionella* to limit growth and amplification. Amplification can impact downstream and upstream service connections and pipe work, resulting in increased contamination of the water system over time. Therefore, control of growth conditions within a water system with appropriate water management practices significantly reduces the risk of exposure to *Legionella* bacteria.

Available Guidance

The assessment technique and recommendations draw upon principles and concepts contained in the guidelines and references listed below, as well as other industry guidelines and documents:

- American Industrial Hygiene Association (AIHA): "Recognition, Evaluation and Control of *Legionella* in Building Water Systems, 2nd Ed. (2022)

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): “ANSI/ASHRAE Standard 188-2021 Legionellosis: Risk Management for Building Water Systems” (2021)
- United States Centers for Disease Control (CDC) “Toolkit for Controlling *Legionella* in Common Sources of Exposure (*Legionella* Control Toolkit)” (2021)
- United States Centers for Disease Control (CDC) “Developing a Water Management Program to Reduce *Legionella* Growth & Spread in Buildings: A Practical Guide to Implementing Industry Standards, Version 1.1” (2021)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): “ASHRAE Guideline 12-2020 Managing the Risk of Legionellosis Associated with Building Water Systems” (2020)
- United States Environmental Protection Agency (EPA): “Technologies for *Legionella* Control in Premise Plumbing Systems: Scientific Literature Review” (2016)

Site Characterization

A site and water systems characterization has been previously described in FACS reports dated June 23, 2023, June 1, 2023, and May 8, 2023.

Site History

Based on conversations with site representatives, FACS developed the following site history:

- In April 2023, DIR was notified of an employee with a legionellosis diagnosis.
- The employee worked on level 2 of the state building.
- DIR contacted FACS on April 14, 2023, to perform a due diligence limited *Legionella* assessment with a focus on previous positive locations, as sampled by a separate party (DGS’ water treatment contractor). This assessment was also established to shadow the water treatment contractor for DGS for due diligence sampling.
- On April 17 & 18, 2023, FACS was on site to conduct an initial assessment and water sampling at the building.
- A professional water treatment contractor was retained by DGS, who performed hyperchlorination of the DHW & DCW systems serving the building. The hyperchlorination protocol was developed by DGS’ water treatment contractor.
- On April 21, 2023, point of use (POU) or in-line filters were installed on sinks and showers by DGS and the water treatment contractor as an additional control measure. This was done only at locations where positive sample results were collected.
- On April 24, 2023, FACS received preliminary water sample results from the laboratory. Verbal recommendations were provided to DIR and included recommendations for remediation of the DHW and DCW systems at the property.
- FACS was onsite on May 3, 2023, to perform a follow-up assessment to evaluate the efficacy of remediation efforts. Following receipt of positive sampling results at various fixtures, FACS made recommendations for corrective actions, including addressing all fixtures that were represented by the positive sampling results, not just the specific fixtures sampled.
- On June 2, 2023, DGS replaced only the specific fixtures where positive *Legionella* samples were found and installed POU filters.
- FACS was onsite on June 6, 2023, to perform a second follow-up assessment to evaluate the efficacy of remediation efforts. Following receipt of positive sampling results at various fixtures, FACS made recommendations for corrective actions, including addressing all fixtures that were represented by the positive sampling results, in addition to the specific fixtures sampled.

- FACS was onsite July 6, 2023, to perform a third follow-up assessment to evaluate the efficacy of remediation efforts. DGS had replaced all automated restroom fixtures in the building and drinking fountains had either been replaced or thoroughly cleaned and disinfected prior to this assessment. Following receipt of positive sampling results at various locations, FACS made recommendations for corrective actions.
- FACS was onsite August 10, 2023, to perform a fourth follow-up assessment to evaluate the efficacy of remediation efforts. Point of use and/or in-line filtration was in place at all fixtures within the building. Following receipt of positive sampling results at various locations, FACS made recommendations for corrective actions.

Scope of Work

In the course of this project, FACS conducted the following scope of work:

1. Development of a site characterization and history (see sections above).
2. Review of available plumbing plans and diagrams provided by DIR and DGS representatives where available.
3. Visual assessment of representative water systems and components including collection of environmental data (e.g., water temperature/oxidant/pH) from representative water systems and components.
4. Collection of water samples for *Legionella* bacteria from representative water systems and components with a focus on the centralized domestic hot and cold water systems and locations that had previous positive results.
5. Development of a site-specific Water Management Program (WMP), participation in the site Water Management Team (WMT) meetings and ongoing support of WMP implementation.

Sampling and Analytical Methods

Legionella Samples

Water samples for *Legionella* analysis were collected from representative water systems and components at the facility during the assessment. Each water sample was selected based on review of the plumbing plans, building characteristics, and water systems distribution and related risk assessment to assess potential sources of *Legionella* amplification.

FACS collected both pre-flush and post-flush samples from representative point-of-use fixtures throughout the property during the initial assessment (April 17 & 18, 2023) and follow-up assessments (May 3, June 6, 2023, July 6, and August 10, 2023).

Pre-flush samples were collected without flushing the fixture to be representative of water in contact with the fixture since the previous use. Several representative pre-flush samples were collected from fixtures with filtration (POU and/or in-line) intact in order to assess the efficacy of the filtration controls.

Post-flush samples were collected after flushing until the water temperature was stable to represent water originating from the main distribution header. Unless otherwise noted, all samples were collected with the filtration removed.

Each sample type was selected to provide information related to potential sources of *Legionella* in the water supply, pre-flush samples being heavily influenced by the fixture and local plumbing condition, and post-flush samples representing water quality from the municipal supply and main distribution pipes. Additionally, temperature, time to temperature stabilization, pH, and residual disinfectant (monochloramine) readings were collected at representative sampling locations.

Water samples were collected in 250 milliliter sterile plastic containers provided by the laboratory and pre-preserved with sodium thiosulfate. Water samples were shipped overnight to Special Pathogens Laboratory (SPL) for identification, enumeration and serotyping of *Legionella* bacteria. SPL is a Centers

for Disease Control & Prevention (CDC) Environmental Legionella Isolation Techniques Evaluation (ELITE) Program certified laboratory.

A description of the materials and methods used for data and sample collection and analysis can be found in Appendix A.

Findings & Conclusions

General Observations

Backflow Protection

Backflow preventers are devices that are installed to allow water to flow only in one direction and prevent flow in the opposite direction. These devices prevent cross-contamination of bacteria or other contaminants from one water system to another. Backflow preventers are typically in place to separate municipal supply or non-potable water systems (e.g., irrigation or industrial water systems) from potable water systems.

A backflow protection device was observed at the incoming municipal supply on the street prior to entry to the property. Appropriate backflow protection was also observed at DCW connections to ICW distribution and components.

Scale, Debris, and Biofilm

The presence of scale, biofilm, and other debris or particulate can serve as a nutrient source as well as surface area that can promote the growth of Legionella in water systems. All fixtures have been recently replaced, no fixtures identified with scale or biofilm. Heavy discoloration was observed at the DHW Storage Tank.

Chemistry & Temperature

In domestic water, a residual monochloramine concentration of at least 0.5 milligrams per liter (mg/L) with a maximum of <4.0 mg/L is typically recommended in the available guidance. The disinfection efficacy of monochloramine is less impacted by pH as compared with chlorine, with a recommended pH for domestic water system ranging from approximately 7.5 – 9.0 pH units.

Most available guidance documents regarding the control of Legionella in building water systems recommend that the temperature of cold-water systems be maintained below 68-77°F for the prevention of amplification of Legionella. Recommended domestic hot water temperatures are typically ≥120°F at the delivery point and ≥140°F for hot water storage. According to the CDC, the ideal temperatures for Legionella growth typically lie between 77-113°F.

FACS collected field samples for monochloramine, temperature, time to temperature stabilization, and pH at various fixtures and components within the domestic water systems on the property during the August 10, 2023 follow-up assessment. The measurements are summarized in the figure below, with further details and discussion in the following sections:

Water Quality Parameters Overview (8/10/2023)					
		Disinfectant (mg/L)	Temperature (°F)	pH	Time to Temperature (sec)
Target Ranges:		0.5 - 4.0	Ideal: ≤ 68, ≥ 120 Avoid: ≥77, < 120	7.5 - 9.0	>60 may indicate low usage
City Supply Water		1.93	72	8.2	<30
Domestic Hot Water	MIN	0.03	123	8.3	15
	MAX	1.66	130	9.2	90
	AVG	0.50	127	8.6	38
Domestic Cold Water	MIN	0.45	72	7.8	30
	MAX	1.82	94	8.6	30
	AVG	1.35	76	8.1	30

Incoming Municipal Supply

The domestic cold water (DCW) temperature at the incoming point of entry was 72°F, which was below the recommended DCW delivery temperature of ≤77°F, outside of the ideal growth range for *Legionella*.

The stabilized monochloramine measurement was 1.93 mg/L, at the incoming point of entry into the building, which was above the recommended minimum monochloramine concentration for *Legionella* control in potable water of 0.5 mg/L, indicating water entering the building is within the acceptable range. pH was measured at 8.2, within the acceptable range for monochloramine disinfection efficacy. Conditions supportive of amplification were not observed, though temperature and disinfectant levels can fluctuate seasonally.

Domestic Cold Water (DCW)

Temperature measurements at DCW sampling points during the follow-up assessment ranged from 72-94°F, with one sample measured above the maximum recommended temperature for DCW (≤77°F), at the DCW expansion tank lead line on the roof. Temperatures were found to stabilize quickly, within 30 seconds, indicating that turnover of the DCW at the locations is typical of frequently used fixtures.

Testing for residual disinfectant at the DCW sampling points found concentrations of monochloramine within the target range for disinfection of domestic water systems (≥0.5 mg/L), with the exception of the DCW expansion tank which measured 0.45 mg/L, just below the minimum target range. pH measurements at the DCW sampling points were within the recommended target range for potable water treated with monochloramine.

Domestic Hot Water (DHW)

Temperature measurements were collected at representative DHW fixtures and component sampling points, to include the DHW Storage Tank and the Break Room sinks which are equipped with point of use “instant-hot” water heaters (POUH). Make-up water for the POUH is provided by the DCW distribution. There is no DHW supply to the Break Room sinks. Temperatures measured were all found to be within the recommended targets for control of *Legionella* in water systems, ranging from 123-130°F. Temperatures were generally found to stabilize quickly, within 30-60 seconds, with the exception of the sink fixture in the 3 West Women’s Restroom adjacent to J-32, which took approximately 90 seconds to stabilize, suggesting that usage of the DHW at this fixture may be low.

Testing for residual disinfectant at DHW sampling points generally found low concentrations of monochloramine which ranged from 0.03-1.66 mg/L, with all but two of the locations sampled below the target range for disinfection of domestic water systems (≥0.5 mg/L). pH measurements at DHW sample points were within the recommended target range for potable water treated with monochloramine during all assessments.

Legionella Sample Results

Limited guidance is available from several agencies and organizations for the interpretation of *Legionella* sample results. The CDC and AIHA provide some quantitative recommendations for interpreting sample results by water source as well as subsequent corrective actions to be taken based upon currently available guidance and knowledge. The CDC recommends a multi-factorial approach to sample interpretation that includes sample concentration, change in sample concentration over time, the extent of sample positivity, and the type or species of *Legionella* identified. The AIHA approach to interpretation is based on sample concentration with recommendations based on concentration and whether legionellosis cases have been identified. The CDC and AIHA interpretation guidance are provided in Appendix E.

- *Legionella* sample results from previous initial and follow-up assessments are detailed in the FACS reports dated May 8, 2023, June 1, 2023, June 23, 2023 and July 24, 2023.

Municipal Water

Legionella was not detected in the sample (0% positivity) collected from the municipal supply during the follow up assessment on August 10, 2023.

These sample results meet criteria established by the CDC for a controlled water system. They also meet criteria established by the AIHA to indicate no action is required in the DCW system. Therefore, amplification of *Legionella* in the municipal water is not suspected. However, *Legionella* and other pathogens are known to be endemic to water and can be detected at low levels.

Domestic Cold Water (DCW)

Legionella was detected in three (3) of the fourteen (14) samples (21% positivity) collected from the DCW system during the follow-up assessment. Concentrations of *Legionella* ranged from 0.5 - 30.0 CFU/mL with the following type identified: *Legionella anisa* and *Legionella pneumophila* not serogroups 1-6. *Legionella pneumophila* types are highly associated with *Legionella*-related illness according to the CDC.

These sample results meet criteria established by the CDC for a poorly controlled or uncontrolled water systems based on concentration, extent of positivity, increase in concentration over time, and types of *Legionella* identified. They also meet criteria established by the AIHA to indicate *Legionella* growth in the DCW system and distribution piping. Therefore, re-amplification of *Legionella* in the central DCW system following initial hyperchlorination is suspected.

Domestic Hot Water (DHW)

Legionella was detected in three (3) of the fourteen (14) samples (21% positivity) collected from the DHW system during the follow-up assessment. Concentrations of *Legionella* ranged from 5.0 - 50.0 CFU/mL with the following type identified: *Legionella pneumophila* not serogroups 1-6. *Legionella pneumophila* types are highly associated with *Legionella*-related illness according to the CDC.

These sample results meet criteria established by the CDC for a poorly controlled or uncontrolled water system based on concentration, extent of positivity, increasing concentration over time, and types of *Legionella* identified. They also meet criteria established by the AIHA to indicate *Legionella* growth in the DHW system and distribution piping. Therefore, re-amplification of *Legionella* in the central DHW system following initial hyperchlorination is suspected. DHW temperatures measured at representative points have decreased to below the recommended minimum over time, which may be contributing to re-amplification.

It should be noted that POU and in-line filters have been installed at all fixtures and all samples collected with the filters in place did not detect *Legionella*, which indicates that filters are effective in controlling potential exposure to *Legionella* in the central water systems.

Point of Use Fixtures

Samples were collected from representative POU fixtures to include: breakroom sinks, janitor closet mop sinks, drinking fountains, restroom automated sinks and restroom showers. *Legionella* was not detected in samples (0% positivity) collected from the breakroom sinks, which meets the criteria established by the CDC for controlled fixtures. They also meet criteria established by the AIHA to indicate growth is not suspected and no action is required. Therefore, localized amplification of *Legionella* at is not suspected at the Breakroom Sinks.

Legionella was detected in all three (3) of the pre-flush (unfiltered) samples collected during the assessments. Pre-flush sampling locations included the Women's Restroom 13-1 shower, the Janitor Closet J-32 mop sink and the drinking fountain adjacent to 301-32, with detectable concentrations of 10, 5 and 50 CFU/mL, respectively. The type identified in all samples was *Legionella pneumophila* not serogroups 1-6. *Legionella pneumophila* types are highly associated with *Legionella*-related illness according to the CDC. These sample results meet the criteria established by the CDC for a poorly controlled or uncontrolled fixture based on concentration and type of *Legionella* identified. They also

meet criteria established by the AIHA to indicate *Legionella* growth at the fixture. Localized *Legionella* amplification is suspected at the Women's Restroom 13-1 shower, the Janitor Closet J-32 mop sink and the drinking fountain adjacent to 301-32. There is potential for localized amplification of *Legionella* in other restroom showers, drinking fountains and janitor closet mop sinks.

Detectable concentrations of *Legionella* were found in the DCW post-flush samples collected at the 2 Est Men's Restroom 23 sink (0.5 CFU/mL) and the 1 East Women's Restroom 31-1 shower (5.0 CFU/mL). Additional post-flush sampling of the DHW at Men's Restroom 23 and 22 sinks and the Janitor Closet J-32 mop sink indicated detectable *Legionella* at concentrations of 50 CFU/mL (Men's Restroom 23) and 5.0 CFU/mL in Men's Restroom 22 sink and the Janitor Closet J-32 mop sink. The type identified in all samples was *Legionella pneumophila* not serogroups 1-6. *Legionella pneumophila* types are highly associated with *Legionella*-related illness according to the CDC.

At fixtures where both the pre and post-flush samples contain detectable *Legionella* (Janitor Closet J-32 mop sink and Women's Restroom 13-1 shower) localized amplification is suspected. Fixtures at which only the post-flush sample found *Legionella* are likely related to re-amplification of *Legionella* in the circulating domestic water system. However, recommendations for all fixture types are provided as a measure of precaution.

It should be noted that POU and in-line filters have been installed at all fixtures and all samples collected with the filters in place did not detect *Legionella*, which indicates that filters are effective in controlling potential exposure to *Legionella* in the central water systems.

Mechanical Equipment

Results of follow-up sampling collected at the rooftop DHW Storage Tank were none-detected for *Legionella*. Previous sampling of the rooftop DCW expansion tank indicated localized *Legionella* contamination. The sample collected at the DCW expansion tank inlet drain during the August assessment found *Legionella* concentrations of 30 CFU/mL. The type identified was *Legionella anisa*. *Legionella anisa* is not typically associated with *Legionella*-related illness according to the CDC.

Temperature measurements in the DCW from the expansion tank were found to be within the growth range for *Legionella*, with residual disinfectant measuring just below the recommended minimum. Temperature measurements above the recommended maximum temperature at the DCW Expansion Tank are likely due to the configuration of the nearby domestic hot water return piping and the absence of insulation at the associated pipework. Disinfectant levels collected at the DHW Storage Tank were also slightly below the recommended minimum for control of *Legionella*. The measured temperature at the DHW Storage Tank was 130°F, outside of the growth range for *Legionella*.

Legionella amplification is not suspected within the DHW Storage Tank. However, heavy discoloration was observed at the water while flushing the drain line, suggesting that blowdown frequency may not be adequate for controlling accumulation of sediment and scale/corrosion (rust).

Localized *Legionella* contamination is suspected at the expansion tank. The expansion tank does not represent a risk for occupant exposure as there is no exposure point where water is accessible. However, recommendations are provided to prevent *Legionella* contamination of downstream systems.

A summary of assessment findings, data, and sampling results is provided in Appendix B of this report.

Previous Recommendations

Following the initial assessment (April 17 & 18 2023) and each of the follow-up assessments (May 3, June 6, and July 6, 2023), verbal and written recommendations were provided to building representatives for immediate implementation. The previous recommendations are summarized in the table below:

Table 3: Previous Recommendations Summary

FACS Previous Recommendations Summary		Completed (✓)
#	Recommendations Made After the Initial Assessment	
(April 17-18, 2023)		
1	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address <i>Legionella</i> amplification in the domestic hot and cold-water systems for the building.	<input type="checkbox"/>
2	Remediation of the domestic hot and cold-water systems should be included in the corrective action plan. Consult with a qualified water treatment contractor regarding the most appropriate methods, however chemical treatment (e.g., with a chemical oxidant) is often referenced as an effective method for short-term remediation.	<input type="checkbox"/>
3	If point of use (POU) and in-line filters are installed to control potential <i>Legionella</i> exposure while remediation efforts are completed and confirmed effective, a plan needs to be developed for regular inspection and replacement of filters.	<input type="checkbox"/>
4	Additional recommendations for the building include ensuring the DHWST is supplying water consistently stored at 140°F or above. Where scalding concerns are present, delivery temperatures should be targeted as close to 120°F as possible.	<input type="checkbox"/>
5	Perform a visual assessment of accessible point-of-use fixtures, aerators, and laminar flow devices to identify areas of excessive scale, corrosion, biofilm, or debris. Perform cleaning and disinfection of fixtures, aerators, and laminar flow devices exhibiting excessive scale, corrosion, biofilm, or debris. Alternatively, these fixtures, aerators, and laminator flow devices can be replaced.	<input type="checkbox"/>
6	Following any additional remediation activities, perform validation sampling to ensure efficacy of remediation efforts to reduce <i>Legionella</i> concentrations in the building.	<input type="checkbox"/>
7	Consider the development and implementation of a comprehensive water management plan to manage ongoing <i>Legionella</i> risk for the property in the future.	<input type="checkbox"/>
#	Recommendations Made After the First Follow-Up Assessment	
(May 3, 2023)		
1	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address the identified localized contamination at fixtures represented by the sample results.	<input type="checkbox"/>
2	Physically clean and disinfect, or alternatively replace, all fixtures represented by positive sample results. Filtration should remain in place until follow-up sampling demonstrates adequate control of localized <i>Legionella</i> contamination.	<input type="checkbox"/>
3	Perform ongoing follow-up sampling at regular intervals (e.g., every two weeks for three months followed by every month for an additional three months) to validate continued control of <i>Legionella</i> amplification in the building.	<input type="checkbox"/>
#	Recommendations Made After the Second Follow-Up Assessment	
(June 6, 2023)		
1	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address the identified localized contamination at fixtures represented by the sample results.	<input type="checkbox"/>
2	It is recommended to thoroughly clean (including removal of scale and debris) and disinfect all drinking fountains, followed by validation sampling. In the interim, all of these fixtures should be removed from service, as installation of point of use filters is not feasible.	<input type="checkbox"/>
3	It is recommended that all automated fixtures be disinfected or replaced, followed by validation sampling. In the interim, all of these fixtures should be equipped with point of use filters or removed from service. It should be noted that while these fixtures have in-line filters in place between building piping and the fixture, such filters do not protect from <i>Legionella</i> in the fixture itself and associated lines after the filter.	<input type="checkbox"/>
4	It is recommended that the DCW expansion tank be cleaned and disinfected. In addition, the location of this tank and its proximity to nearby hot water lines should be evaluated in order to reduce future risk of <i>Legionella</i> amplification.	<input type="checkbox"/>

FACS Previous Recommendations Summary		Completed (✓)
#	Recommendations Made After the Initial Assessment	
5	Perform ongoing follow-up sampling at regular intervals (e.g., every two weeks for three months followed by every month for an additional three months) to validate continued control of <i>Legionella</i> amplification in the building.	<input type="checkbox"/>
#	Recommendations Made After the Third Follow-Up Assessment	
(July 6, 2023)		
1	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address the identified localized contamination at fixtures represented by the sample results. This action plan should include a daily flushing program. Consider hyperdisinfection to address potential re-amplification of <i>Legionella</i> in the centralized DHW and DCW water systems serving the building.	<input type="checkbox"/>
2	Install in-line filters on the drinking fountains or, alternatively, remove drinking fountains from service if an appropriate filtration option cannot be identified.	<input type="checkbox"/>
3	Increase the temperature of the domestic hot water storage tank (DHWST) such that DHW delivery temperatures are as close to 120°F as possible. Available guidance recommends that DHW is consistently stored at 140°F or above and DHW delivery temperatures be 120°F or above. The risk of scalding should be considered in accordance with local public health regulations, as applicable.	<input type="checkbox"/>
4	Evaluate the configuration of the roof top DCW expansion tank and its proximity to the nearby domestic hot water return line to assess the potential for conductive heat gain. Consult with a building engineer, as needed.	<input type="checkbox"/>
5	Continue to implement point-of-use and in-line filtration at all building fixtures until further validation sampling demonstrates that the <i>Legionella</i> amplification is controlled in building water systems.	<input type="checkbox"/>
6	Perform ongoing follow-up sampling at regular intervals (e.g., every two weeks for three months followed by every month for an additional three months) to validate continued control of <i>Legionella</i> amplification in the building.	<input type="checkbox"/>
7	Work towards the development and implementation of a comprehensive water management plan to manage ongoing Legionella risk for the property in the future.	<input type="checkbox"/>
END		

Follow-up Sampling Recommendations (August 10, 2023)

Water System Assessment & Sampling Recommendations 8/10/23		Completed (✓)
(August 10, 2023)		
1	Review all previous recommendations from the initial assessment (April 17 & 18 2023) and each of the follow-up assessments (May 3, June 6, July 6 & 7 and August 10, 2023) and document completed actions in the site WMP Corrective Action Log.	<input type="checkbox"/>
2	Develop a corrective action plan within a reasonable timeframe (i.e., within about a week) to address the identified localized contamination at fixtures represented by the sample results. This action plan should include a daily flushing program. Consider hyperdisinfection to address potential re-amplification of <i>Legionella</i> in the centralized DHW and DCW water systems serving the building.	<input type="checkbox"/>
3	Consider remediation of the domestic hot and cold-water systems as part of the corrective action plan. Consult with a qualified water treatment contractor regarding the most appropriate methods, however chemical treatment (e.g., with a chemical oxidant) is often referenced as an effective method for short-term remediation.	<input type="checkbox"/>

Water System Assessment & Sampling Recommendations 8/10/23		Completed (✓)
4	Following implementation of recommended corrective actions, conduct follow-up sampling of previous positive locations, representative near and distal fixtures and system components.	<input type="checkbox"/>
5	Evaluate the configuration and usage of the sink faucets in the 3 West Women's Restroom adjacent to J-32. Conduct regular flushing where areas of low-use or low flow are identified. Document actions and store with the site WMP documentation for review at the next WMT meeting.	<input type="checkbox"/>
6	Continue to implement point-of-use and in-line filtration at all building fixtures until further validation sampling demonstrates that the <i>Legionella</i> amplification is controlled in building water systems.	<input type="checkbox"/>
7	Clean and disinfect the fixtures (all the way to the angle stop) in which detectable pre-flush results were found. Alternatively these fixtures can be replaced.	<input type="checkbox"/>
8	Ensure that the DHWST is supplying water consistently stored at a temperature that ensures delivery temperatures as close to 120°F as possible.	<input type="checkbox"/>
9	Evaluate the configuration of the roof top DCW expansion tank and its proximity to the nearby domestic hot water return line to assess the potential for conductive heat gain. Consult with a building engineer, as needed.	<input type="checkbox"/>
END		

Limitations

This investigation is limited to the conditions and practices observed and information made available to FACS. The methods, conclusions, and recommendations provided are based on FACS' judgment, experience and the standard of practice for professional service. They are subject to the limitations and variability inherent in the methodology employed. As with all environmental investigations, this investigation is limited to the defined scope and does not purport to set forth all hazards, nor indicate that other hazards do not exist.


Please do not hesitate to contact our office if you have any additional questions or concerns. Thank you for the opportunity to assist the California Department of Industrial Relations (DIR) in promoting a more healthful environment.

Respectfully,
FORENSIC ANALYTICAL



Madeleine Rebullida
Senior Project Manager, SF Office

Reviewed by,
FORENSIC ANALYTICAL



Megan Canright Racicot, MPH, CIH
Director of Scientific Operations



Appendix A

Data Collection and Laboratory Methods

Legionella. Sample collection materials were provided by the laboratory performing the analysis. All bacterial samples were collected using aseptic technique. For water samples, approximately 250 milliliters (mL) of water were collected using wide-mouth sterile plastic containers containing sodium thiosulfate preservative. Collection of pre-flush (first-draw) water samples at fixtures was performed first, followed by collection of post-flush (late-draw) samples from fixtures when the water temperature had stabilized (typically after approximately one minute of flushing). Collection of water temperature, residual disinfectant, and pH measurements was performed alongside water sampling.

Water samples were collected in plastic containers provided by the laboratory and pre-preserved with sodium thiosulfate. The samples were sealed and labeled and placed in an insulated container for shipment. Samples were sent under chain of custody to Special Pathogens Laboratories (SPL) for culture analysis for *Legionella* using the International Organization for Standardization (ISO) Method 11731:2017 (E). SPL is a CDC Environmental *Legionella* Isolation Techniques Evaluate (ELITE) proficient laboratory for analysis of *Legionella*. Samples were transported in insulated packaging to the analytical laboratory and reached the laboratory within 24 hours of collection. Results are presented as a concentration of viable *Legionella* in colony forming units per milliliter of sample (CFU/mL).

Water Sampling Colorimetry. All colorimetric measurements were collected using a Hach DR900 colorimeter. A small volume of water was collected into a cuvette, which was used to blank correct the colorimeter with each new source of water sampled. Following blank adjustment, a reagent powder or liquid, specific to the type of measurement, was added to the sample and the sample was agitated to facilitate reaction. After a reaction period specified by the appropriate method (listed below), the cuvette was then inserted into the colorimeter and read for specific concentration.

Chemical	US EPA Method	Detectable Range (mg/L)	Reagent Type/s	HACH #
Monochloramine	Indophenol 10171	0.04-4.50 Cl ₂	Monochlor F Reagent Pillows	DOC316.53.01015

Temperature. Temperature was measured using a National Institute of Standards and Technology (NIST) traceable thermometer. Water was collected in a satellite container and the temperature probe was inserted and swirled in the water to ensure adequate probe contact, mixing, and to reduce temperature stratification during temperature measurement.

pH. Measurements of pH were collected using a calibrated pen-type pH meter. Water was collected in a satellite container and the pH probe was inserted into the water to collect a measurement.

Appendix B

Data Summary Tables

Table 4: Water Sampling Data Summary Table – Follow-up Assessment (August 10, 2023)

Legionella Sampling Results Table								
Date: August 10, 2023								
Location: Mission Valley State Building, San Diego, California								
Floor	Sample ID	Location/Dept	Sample Site	Water Type	System Point	*Sample Type	Legionella Culture	
							CFU/mL	Species ID & serogroup
Roof	W171	DHWST	drain line	DHW	Near	Post-flush	ND	\
	W172	DCW Expansion Tank	inlet drain	DCW	Distal	Post-flush	30	<i>L. anisa</i>
3 West	W173	Janitor Closet J-32	Mop Sink	DHW	Distal	Pre-flush	50	<i>L. pneumophila, not 1-6</i>
	W174	Janitor Closet J-32	Mop Sink	DHW	Distal	Post-flush	5.0	<i>L. pneumophila, not 1-6</i>
	W175	Drinking Fountain adj to 301-32	R bubbler	DCW	Distal	Pre-flush	5.0	<i>L. pneumophila, not 1-6</i>
	W176	Drinking Fountain adj to 301-32	R bubbler	DCW	Distal	Post-flush	ND	\
	W177	Women's Restroom adj to J-32	Center sink	DHW	Distal	Filter On	ND	\
	W178	Women's Restroom adj to J-32	Center sink	DHW	Distal	Post-flush	ND	\
	W181	Men's Restroom adj to J-32	Center sink	DHW	Distal	Post-flush	ND	\
3 East	W179	Janitor Closet J-30	mop sink	DCW	Distal	Post-flush	ND	\
	W180	Suite 300 Break Room	sink	DCW	Near	Post-flush	ND	\
	W194	Suite 300 Break Room	sink	POUH	Near	Post-flush	ND	\
2 West	W182	Women's Restroom 21	R sink	DHW	Mid	Post-flush	ND	\
	W183	Men's Restroom 22	R sink	DCW	Mid	Post-flush	ND	\
	W184	Men's Restroom 22	R sink	DHW	Mid	Post-flush	5.0	<i>L. pneumophila, not 1-6</i>
	W192	Suite 201 Break Room	sink	DCW	Mid	Post-flush	ND	\
	W193	Suite 201 Break Room	sink	POUH	Mid	Post-flush	ND	\
2 East	W185	Drinking Fountain adj to 201-3	L bubbler	DCW	Mid	Post-flush	ND	\
	W186	Men's Restroom 23	L sink	DCW	Mid	Post-flush	0.5	<i>L. pneumophila, not 1-6</i>
	W187	Men's Restroom 23	L sink	DHW	Near	Post-flush	50	<i>L. pneumophila, not 1-6</i>



Legionella Sampling Results Table								
Date: August 10, 2023								
Location: Mission Valley State Building, San Diego, California								
Floor	Sample ID	Location/Dept	Sample Site	Water Type	System Point	*Sample Type	Legionella Culture	
							CFU/mL	Species ID & serogroup
1 West	W188	Women's Restroom 24	R sink faucet	DHW	Mid	Filter On	ND	\
	W189	Women's Restroom 24	R sink faucet	DHW	Mid	Post-flush	ND	\
	W190	Women's Restroom 24	R sink faucet	DCW	Mid	Post-flush	ND	\
	W191	Women's Restroom 24	L sink faucet	DHW	Mid	Post-flush	ND	\
	W195	Drinking Fountain adj to 110-14	R bubbler	DCW	Near	Post-flush	ND	\
	W196	Men's Restroom 11-1	R sink faucet	DHW	Mid	Post-flush	ND	\
	W197	Men's Restroom 11-1	R sink faucet	DCW	Mid	Post-flush	ND	\
1 East	W198	Women's Restroom 13-1	Shower	DHW	Near	Filter On	ND	\
	W199	Women's Restroom 13-1	Shower	DHW	Near	Pre-flush	10	<i>L. pneumophila, not 1-6</i>
	W200	Women's Restroom 13-1	Shower	DHW	Near	Post-flush	ND	\
	W201	Women's Restroom 13-1	Shower	DCW	Near	Post-flush	5.0	<i>L. pneumophila, not 1-6</i>
	W202	Suite 102 Break Room	sink	DCW	Near	Post-flush	ND	\
	W203	Suite 102 Break Room	sink	DHW	Near	Post-flush	ND	\
EXT	W204	W of Bldg., Metropolitan Rd.	Municipal BFP	City Supply	POE	Post-flush	ND	\

Table Notes:
Filter On = filter in place for sample collection
DCW = Domestic Cold Water
DHW = Domestic Hot Water
POUH = Point of Use Heater (served by DCW)
POE = Point of Entry
BFP = Backflow Preventer
CFU/mL = Colony Forming Units per milliliter
"ND" = None Detected (no growth or below the limit of detection)
The limit of detection (LOD) is approximately - 0.5 - 5 CFU/mL for Potable Water; 5 CFU/mL for Non-Potable Water (Cooling Towers).
LOD values are mathematically derived by the testing laboratory according to the sample type, volume, and process.
Laboratory Culture Method: ISO 11731:2017 (E). QA/QC performed on the date processed.
Laboratory is Accredited by the American Association for Laboratory Accreditation (Cert. No. 2847.01) and CDC ELITE certified.

Table 5: Water Chemistry Data Summary Table – Follow-up Assessment (August 10, 2023)

Water Chemistry Measurements Data Table								
Date: August 10, 2023								
Location: Mission Valley State Building, San Diego, California								
Floor	Location/Dept.	Sample Site	Water Type	System Point	Disinfectant <i>NH₃Cl</i> (mg/L)	Temp (°F)	pH	Time to Temp. (sec)
Roof	DHWST	drain line	DHW	Near	0.16	130	9.2	<30
	DCW Expansion Tank	inlet drain	DCW	Distal	0.45	94	8.6	<30
3 West	Janitor Closet J-32	Mop Sink	DHW	Distal	0.31	126	8.5	30
	DF adj 301-32	R bubbler	DCW	Distal	1.45	75	8.2	<30
	Women's RR adj J-32	Center sink	DHW	Distal	0.23	127	8.5	~90
	Men's RR adj J-32	Center sink	DHW	Distal	0.34	130	8.5	15
3 East	Janitor Closet J-30	mop sink	DCW	Distal	1.44	74	8.3	30
	Suite 300 Break Room	sink	DCW	Near	1.37	76	8.1	30
2 West	Women's RR 21	R sink	DHW	Mid	0.38	130	8.4	<30
	Men's RR 22	R sink	DCW	Mid	1.73	75	7.8	<30
	Men's RR 22	R sink	DHW	Mid	1.24	128	8.5	<30
	Suite 201 Break Room	sink	DCW	Mid	\	73	7.9	30
	Suite 201 Break Room	sink	POUH	Mid	1.66	124	8.3	<30
2 East	DF adj 201-3	L bubbler	DCW	Mid	1.82	74	8.1	<30
	Men's RR 23	L sink	DCW	Mid	1.73	74	8.0	<30
	Men's RR 23	L sink	DHW	Near	1.04	130	8.7	<30
	Women's RR 24	R sink faucet	DHW	Mid	0.14	128	8.7	60
	Women's RR 24	R sink faucet	DCW	Mid	\	75	7.9	<30
	Women's RR 24	L sink faucet	DHW	Mid	0.03	129	8.7	<30
1 West	DF adj 110-14	R bubbler	DCW	Near	1.51	73	8.0	30
	Men's RR 11-1	R sink faucet	DHW	Mid	0.21	123	8.8	30
	Men's RR 11-1	R sink faucet	DCW	Mid	\	74	7.9	<30
1 East	Women's RR 13-1	Shower	DHW	Near	0.20	123	8.7	30
	Suite 102 Break Room	sink	DCW	Near	0.68	72	8.3	30
	Suite 102 Break Room	sink	DHW	Near	\	127	8.7	60
EXT	W of Bldg., Metropolitan Rd.	Municipal BFP	City Supply	POE	1.93	72	8.2	<30

Water Chemistry Measurements Data Table Date: August 10, 2023 Location: Mission Valley State Building, San Diego, California										
Floor	Location/Dept.	Sample Site	Water Type	System Point	Disinfectant <i>NH₃Cl</i> (mg/L)	Temp (°F)	pH	Time to Temp. (sec)		
<p><u>Table Notes:</u></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p style="text-align: center;"><u>Target Ranges</u></p> <p>Monochloramine (NH₃Cl): 0.5 - 4.0 mg/L</p> <p>pH: 7.5 - 9.0</p> <p>Stabilized Delivery Temperatures: Ideal: ≤ 68°F, ≥ 120°F</p> <p>Avoid: ≥77°F, < 120°F</p> </td> <td style="width: 50%; vertical-align: top;"> <p>DCW = Domestic Cold Water</p> <p>DHW = Domestic Hot Water</p> <p>POUH = Point of Use Heater (served by DCW)</p> <p>POE = Point of Entry</p> <p style="text-align: right;">BFP = Backflow Preventer</p> </td> </tr> </table>									<p style="text-align: center;"><u>Target Ranges</u></p> <p>Monochloramine (NH₃Cl): 0.5 - 4.0 mg/L</p> <p>pH: 7.5 - 9.0</p> <p>Stabilized Delivery Temperatures: Ideal: ≤ 68°F, ≥ 120°F</p> <p>Avoid: ≥77°F, < 120°F</p>	<p>DCW = Domestic Cold Water</p> <p>DHW = Domestic Hot Water</p> <p>POUH = Point of Use Heater (served by DCW)</p> <p>POE = Point of Entry</p> <p style="text-align: right;">BFP = Backflow Preventer</p>
<p style="text-align: center;"><u>Target Ranges</u></p> <p>Monochloramine (NH₃Cl): 0.5 - 4.0 mg/L</p> <p>pH: 7.5 - 9.0</p> <p>Stabilized Delivery Temperatures: Ideal: ≤ 68°F, ≥ 120°F</p> <p>Avoid: ≥77°F, < 120°F</p>	<p>DCW = Domestic Cold Water</p> <p>DHW = Domestic Hot Water</p> <p>POUH = Point of Use Heater (served by DCW)</p> <p>POE = Point of Entry</p> <p style="text-align: right;">BFP = Backflow Preventer</p>									



Appendix C

Laboratory Reports and Chain of Custody Forms



FINAL REPORT

Forensic Analytical

Corporate
 21228 Cabot Blvd
 Hayward, CA 94545
 P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Summary

This summary is provided for your convenience. Complete report on the following pages.

Environmental Culture Test-Legionella

Location	Result	Concentration	Species
77084-0810-W171	Not Detected		
77084-0810-W172	Positive	30.0 CFU/mL	L. anisa (Blue-white Legionella sp.)
77084-0810-W173	Positive	50.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W174	Positive	5.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W175	Positive	5.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W176	Not Detected		
77084-0810-W177	Not Detected		
77084-0810-W178	Not Detected		
77084-0810-W179	Not Detected		
77084-0810-W180	Not Detected		
77084-0810-W181	Not Detected		
77084-0810-W182	Not Detected		
77084-0810-W183	Not Detected		
77084-0810-W184	Positive	5.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W185	Not Detected		
77084-0810-W186	Positive	0.5 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W187	Positive	50.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W188	Not Detected		
77084-0810-W189	Not Detected		
77084-0810-W190	Not Detected		
77084-0810-W191	Not Detected		
77084-0810-W192	Not Detected		
77084-0810-W193	Not Detected		
77084-0810-W194	Not Detected		
77084-0810-W195	Not Detected		
77084-0810-W196	Not Detected		



FINAL REPORT

Forensic Analytical

Corporate
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Hayward, CA 94545
P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Environmental Culture Test-Legionella

Location	Result	Concentration	Species
77084-0810-W197	Not Detected		
77084-0810-W198	Not Detected		
77084-0810-W199	Positive	10.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W200	Not Detected		
77084-0810-W201	Positive	5.0 CFU/mL	L. pneumophila, not serogroups 1-6
77084-0810-W202	Not Detected		
77084-0810-W203	Not Detected		
77084-0810-W204	Not Detected		

Approved by: Jennifer Furlong

Janet E. Stout, Ph.D.
Laboratory Director, Special Pathogens Laboratory



FINAL REPORT

Forensic Analytical

Corporate
21228 Cabot Blvd
Hayward, CA 94545
P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W171	Date Collected:	08/10/2023
Sample ID:	2308-00936.001	Sample Type:	Water
		Time Collected:	8:16 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W172	Date Collected:	08/10/2023
Sample ID:	2308-00936.002	Sample Type:	Water
		Time Collected:	8:29 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	30.0 CFU/mL		
Species:	L. anisa (Blue-white Legionella sp.)		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W173	Date Collected:	08/10/2023
Sample ID:	2308-00936.003	Sample Type:	Water
		Time Collected:	8:47 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	50.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W174	Date Collected:	08/10/2023
Sample ID:	2308-00936.004	Sample Type:	Water
		Time Collected:	8:55 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	5.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

FINAL REPORT

Forensic Analytical

Corporate
 21228 Cabot Blvd
 Hayward, CA 94545
 P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W175	Date Collected:	08/10/2023
Sample ID:	2308-00936.005	Sample Type:	Water
		Time Collected:	9:04 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	5.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W176	Date Collected:	08/10/2023
Sample ID:	2308-00936.006	Sample Type:	Water
		Time Collected:	9:07 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W177	Date Collected:	08/10/2023
Sample ID:	2308-00936.007	Sample Type:	Water
		Time Collected:	9:16 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/23/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W178	Date Collected:	08/10/2023
Sample ID:	2308-00936.008	Sample Type:	Water
		Time Collected:	9:23 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W179	Date Collected:	08/10/2023
Sample ID:	2308-00936.009	Sample Type:	Water
		Time Collected:	9:55 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

FINAL REPORT

Forensic Analytical

Corporate
 21228 Cabot Blvd
 Hayward, CA 94545
 P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W180	Date Collected:	08/10/2023
Sample ID:	2308-00936.010	Sample Type:	Water
		Time Collected:	10:36 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W181	Date Collected:	08/10/2023
Sample ID:	2308-00936.011	Sample Type:	Water
		Time Collected:	10:53 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W182	Date Collected:	08/10/2023
Sample ID:	2308-00936.012	Sample Type:	Water
		Time Collected:	11:08 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W183	Date Collected:	08/10/2023
Sample ID:	2308-00936.013	Sample Type:	Water
		Time Collected:	11:25 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W184	Date Collected:	08/10/2023
Sample ID:	2308-00936.014	Sample Type:	Water
		Time Collected:	11:30 am
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	5.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		



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Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W185	Date Collected:	08/10/2023
Sample ID:	2308-00936.015	Sample Type:	Water
		Time Collected:	11:48 am

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

Location:	77084-0810-W186	Date Collected:	08/10/2023
Sample ID:	2308-00936.016	Sample Type:	Water
		Time Collected:	12:02 pm

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	0.5 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

Location:	77084-0810-W187	Date Collected:	08/10/2023
Sample ID:	2308-00936.017	Sample Type:	Water
		Time Collected:	12:08 pm

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	50.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

Location:	77084-0810-W188	Date Collected:	08/10/2023
Sample ID:	2308-00936.018	Sample Type:	Water
		Time Collected:	12:26 pm

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

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Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W189	Date Collected:	08/10/2023
Sample ID:	2308-00936.019	Sample Type:	Water
		Time Collected:	12:36 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W190	Date Collected:	08/10/2023
Sample ID:	2308-00936.020	Sample Type:	Water
		Time Collected:	12:43 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W191	Date Collected:	08/10/2023
Sample ID:	2308-00936.021	Sample Type:	Water
		Time Collected:	12:50 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W192	Date Collected:	08/10/2023
Sample ID:	2308-00936.022	Sample Type:	Water
		Time Collected:	1:06 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W193	Date Collected:	08/10/2023
Sample ID:	2308-00936.023	Sample Type:	Water
		Time Collected:	1:15 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

FINAL REPORT

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Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W194	Date Collected:	08/10/2023
Sample ID:	2308-00936.024	Sample Type:	Water
		Time Collected:	1:26 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W195	Date Collected:	08/10/2023
Sample ID:	2308-00936.025	Sample Type:	Water
		Time Collected:	1:55 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W196	Date Collected:	08/10/2023
Sample ID:	2308-00936.026	Sample Type:	Water
		Time Collected:	2:06 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W197	Date Collected:	08/10/2023
Sample ID:	2308-00936.027	Sample Type:	Water
		Time Collected:	2:10 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W198	Date Collected:	08/10/2023
Sample ID:	2308-00936.028	Sample Type:	Water
		Time Collected:	2:22 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

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Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W199	Date Collected:	08/10/2023
Sample ID:	2308-00936.029	Sample Type:	Water
		Time Collected:	2:28 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	10.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W200	Date Collected:	08/10/2023
Sample ID:	2308-00936.030	Sample Type:	Water
		Time Collected:	2:32 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W201	Date Collected:	08/10/2023
Sample ID:	2308-00936.031	Sample Type:	Water
		Time Collected:	2:38 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Positive		
Concentration:	5.0 CFU/mL		
Species:	L. pneumophila, not serogroups 1-6		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		
Location:	77084-0810-W202	Date Collected:	08/10/2023
Sample ID:	2308-00936.032	Sample Type:	Water
		Time Collected:	2:52 pm
Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/23/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		



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Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

Location:	77084-0810-W203	Date Collected:	08/10/2023
Sample ID:	2308-00936.033	Sample Type:	Water
		Time Collected:	3:00 pm

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/23/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

Location:	77084-0810-W204	Date Collected:	08/10/2023
Sample ID:	2308-00936.034	Sample Type:	Water
		Time Collected:	3:22 pm

Test Requested:	Environmental Culture Test-Legionella	Status:	Complete 08/18/2023
Result:	Not Detected		
Date Processed:	08/11/2023		
Volume Examined:	0.2 ml of processed sample		

Approved by: Jennifer Furlong

Janet E. Stout, Ph.D.
Laboratory Director, Special Pathogens Laboratory

FINAL REPORT

Forensic Analytical

Corporate
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Hayward, CA 94545
P: (510) 266-4600

Account #: 5842
SPL Project ID: 2308-00936
Project Name: PJ77084
PO Number: 09764
Sampled By: M. Schulz
Date Received: 08/11/2023
Date Final: 08/23/2023

NOTES

Environmental Culture Test-Legionella

- CFU/mL (or swab)=Colony Forming Units per milliliter or swab.
- The limit of detection (LOD)* is approximately - 0.5 - 5 CFU/mL for Potable Water; 5 CFU/mL for Non-Potable Water (Cooling Towers); 0.5 - 5 CFU/mL for Hot Water Tanks; 10 -100 CFU/swab for Swabs.
- * Sensitivity (LOD) may be affected if less than recommended sample volume is submitted for testing and if high concentration of non-Legionella bacteria are present in the sample. LOD values are mathematically derived according to the sample type, volume, and process.
- Results are reported as Not Detected, Positive, or Not Detected*
- Not Detected* The presence of Legionella could not be determined due to overgrowth of non-Legionella bacteria.
- Probable identification. Contact laboratory if further identification by 16S sequencing required.
- Method: ISO 11731:2017 (E). QA/QC performed on the date processed. Turnaround time is 7-10 days.
- Samples should be analyzed within 2 days of collection.
- Accredited by the American Association for Laboratory Accreditation (Cert. No. 2847.01) and CDC ELITE certified.
- Isolates saved upon request. Request must be received 1 week from receipt of report. Extra charges may apply.
- 'Project Name', 'Sampled By', 'Location', 'Date Collected', 'Time Collected' and 'Client Notes' are provided by the customer.

The data and information on this, and other accompanying documents, represent only the sample(s) analyzed. This report is not to be reproduced in whole or in part without the expressed consent of SPL. Results apply to the sample as received.

Chain of Custody: Test Request Form

SPL ID: **J308-00936**

AUG 11 '23 10:13

UID:

Client Information				Sampling Contact				
Account Number 5842	P.O. Number 09764	Submitting Company Forensic Analytical		Name MARTHA SCHULZ	Phone 760-317-0098			Email MSCHULZ@ForensicAnalytical.com
Sample Information								
Project Identifier (Name or Number) P577084			Sampled by M. SCHULZ		Date Collected 8/10/23		Number of Samples	
Samples from New York or Connecticut? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		If yes, is chlorine the primary biocide? Potable water: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Nonpotable water: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Case investigation? (See back for details) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		QuickCheck™? (See back for details) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Sample No.	Sample Description Specific location, source, or site	Sample Type W=Water I=Ice S=Swab O=Other	Water System P=Potable NP=Non-potable HWT=Hot Water Tank	Test Codes (1 code per box)	Time Collected (hr:min)	SPL USE ONLY		
						Acceptable?	Temperature	Comments
77084-0810-W171		W	P	101	0816 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W172				0829 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W173				0847 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W174				0855 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W175				0904 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W176				0907 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W177				0916 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W178				0923 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W179				0955 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W180				10:36 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
	- W181				10:53 a.m./p.m. <input checked="" type="checkbox"/> <input type="checkbox"/>	Y	N	
Relinquished by		Date	Time	Received by		Date	Time	
MARTHA SCHULZ		8/10/23	15:50	JH		8/11/23		

AUG 11 '23 4:10:13

Chain of Custody: Test Request Form

SPL ID: 2308-00936

UID:

Client Information				Sampling Contact				
Account Number 5842	P.O. Number 09764	Submitting Company Forensic Analytical		Name MARTIN SCHULZ	Phone 760-377-0098	Email MSCHULZ@FORENSICANALYTICAL.COM		
Sample Information								
Project Identifier (Name or Number) P577084		Sampled by M. SCHULZ		Date Collected 8/10/23		Number of Samples		
Samples from New York or Connecticut? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		If yes, is chlorine the primary biocide? Potable water: <input type="checkbox"/> Yes <input type="checkbox"/> No Nonpotable water: <input type="checkbox"/> Yes <input type="checkbox"/> No		Case investigation? (See back for details) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		QuickCheck™? (See back for details) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Sample No.	Sample Description Specific location, source, or site	Sample Type W= Water I=Ice S=Swab O=Other	Water System P = Potable NP = Non-potable HWT = Hot Water Tank	Test Codes (1 code per box)	Time Collected (hr:min)	SPL USE ONLY		
						Acceptable?	Temperature	Comments
77084-0810	- W182	W	P	101	11:08 a.m. <input checked="" type="checkbox"/> p.m. <input type="checkbox"/>	Y	N	
	- W183				11:25 a.m. <input checked="" type="checkbox"/> p.m. <input type="checkbox"/>			
	- W184				11:30 a.m. <input checked="" type="checkbox"/> p.m. <input type="checkbox"/>			
	- W185				11:48 a.m. <input checked="" type="checkbox"/> p.m. <input type="checkbox"/>			
	- W186				12:02 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W187				12:08 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W188				12:24 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W189				12:36 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W190				12:43 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W191				12:50 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	- W192				13:06 a.m. <input type="checkbox"/> p.m. <input checked="" type="checkbox"/>			
	Relinquished by				Date			
MARTIN SCHULZ		8/10/23	15:50	JH		8/11/23		

Chain of Custody: Test Request Form

SPL ID: 2308-00936

AUG 11 '23 10:13

UID:

Client Information				Sampling Contact				
Account Number 5842	P.O. Number 09764	Submitting Company Forensic Analytical		Name MARTIN SCHAUZ	Phone 760-317-0098			
				Email MSCHAUZ@FORENSICANALYTICAL.COM				
Sample Information								
Project Identifier (Name or Number) PS 77084		Sampled by M. SCHAUZ		Date Collected 8/10/23		Number of Samples		
Samples from New York or Connecticut? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		If yes, is chlorine the primary biocide? Potable water: <input type="checkbox"/> Yes <input type="checkbox"/> No Nonpotable water: <input type="checkbox"/> Yes <input type="checkbox"/> No		Case investigation? (See back for details) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		QuickCheck™? (See back for details) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Sample No.	Sample Description Specific location, source, or site	Sample Type W=Water I=Ice S=Swab O=Other	Water System P=Potable NP=Non-potable HWT=Hot Water Tank	Test Codes (1 code per box)	Time Collected (hr:min)	SPL USE ONLY		
						Acceptable?	Temperature	Comments
77084-0810-W193		W	P	101	13:15 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W194				13:26 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W195				13:55 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W196				14:05 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W197				14:10 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W198				14:22 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W199				14:28 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W200				14:32 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W201				14:38 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W202				14:42 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W203				15:00 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
	- W204				15:22 a.m./p.m. <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m.	Y		
Relinquished by		Date	Time	Received by		Date	Time	
MARTIN SCHAUZ *		8/10/23	15:50	JH		8/11/23		

Appendix D

Centers for Disease Control and Prevention (CDC) and American Industrial Hygiene Association (AIHA) *Legionella* Sample Interpretation Guidance

Centers for Disease Control and Prevention (CDC) Interpretation Guidelines

Figure 1. Routine *Legionella* testing: A multifactorial approach to performance indicator interpretation*^{oA}

Concentration indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
≥10 CFU/mL [†] in potable water	1.0–9.9 CFU/mL in potable water	Detectable to 0.9 CFU/mL in potable water	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR ≥100 CFU/mL in non-potable water	OR 10–99 CFU/mL in non-potable water	OR Detectable to 9 CFU/mL in non-potable water			

Change in concentration over time indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
100-fold or greater increase in concentration (e.g., 0.05 to 5 CFU/mL)	10-fold increase in concentration (e.g., 0.05 to 0.5 CFU/mL)	<i>Legionella</i> concentration steady (e.g., 0.5 CFU/mL for two consecutive sampling rounds)	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species

Extent indicates that *Legionella* growth appears:

Uncontrolled	Poorly Controlled	Well Controlled			
Detection in multiple locations AND a common source location [‡]	Detection in a common source location that serves multiple areas	Detection in a few of many tested locations within a water system	No <i>Legionella</i> detected in a single round of testing	No <i>Legionella</i> detected in multiple rounds of testing	No <i>Legionella</i> detected in multiple rounds of testing with methods that detect viable and non-viable bacteria of any <i>Legionella</i> species
OR Detection across many locations within a water system	OR Detection in more than one location within a water system				

Type* of *Legionella* (species and serogroup) associated with Legionnaires' disease:

Highly Associated	Less Associated
<i>L. pneumophila</i> serogroup 1; Non-Lp1 <i>L. pneumophila</i> ; Presence of multiple different <i>Legionella</i> species or serogroups	Any non- <i>pneumophila</i> <i>Legionella</i> species including "blue-white" fluorescent <i>Legionella</i>

*This figure is intended for use during routine testing only. Test results are performance indicators and are not a measure of risk of human illness. This figure is not intended for use if a building or device is associated with Legionnaires' disease (LD) cases or an outbreak.

^oSee "Routine testing for *Legionella*" for guidance regarding suggested response activities. Comparable results may lead to different suggested response activities when other factors are considered (e.g., if there is evidence of poorly controlled growth at a healthcare facility).

^AConsidering the type of *Legionella* identified along with other *Legionella* testing performance indicators provides a clearer picture of water system control than the results of any single indicator. For example, facility owners and operators may consider implementing immediate interventions for a healthcare facility with: A. detectable but <10

colony-forming units per milliliter (CFU/mL), B. non-Lp1 *Legionella pneumophila*, C. observed at steady concentrations, but D. detected at multiple distal locations including a central water heater.

[†]Concentrations expressed as CFU/mL are for test results generated by traditional spread plate culture methods. If other test methods are used, consult testing lab or manufacturer instructions for appropriate interpretation.

[‡]Common source location examples include water heaters, hot water returns, storage tanks, and cooling tower basins.

^oIf a facility has a history of associated LD cases, then sequencing isolates obtained during routine testing may provide performance indicators regarding outbreak strain persistence (if that strain is detected).



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

American Industrial Hygiene Association (AIHA) Interpretation Guidelines

Table 3.1: Sample Data Interpretation Guidelines

Sample Source	No Action Required*	Potential for Growth (CFU/mL)	Action **	Possible Growth (CFU/mL)	Action **	Indicates Growth (CFU/mL)	Action **	Notes
Humidifiers and Misters; Decorative Fountains and Water Features; Hot Tubs, Whirlpools and Spas	Non-Detectable	<1	1	1 to <10	2	>10	3	
Potable Water (Incoming Municipal Water)	Non-Detectable	<1	4	1 to <10	5	>10	6	Sampled at backflow preventer or before water enters building
Potable Water (Premise Plumbing)	<1 CFU/mL	1 to <10	7	10 to <100	8	>100	9	Sampled from hot and cold water of premise plumbing
Cooling Towers and Evaporative Condensers	<10 CFU/mL	10 to <100	10	100 to <1000	11	>1,000	12	Some state and local statutes may require specific sampling intervals, remedial actions, and reporting requirements.

*Action Levels based on *Legionella* culture results obtained from laboratory methods in accordance with ISO 11731:2017 (Water quality-Enumeration of *Legionella*).

** Description of Actions outlined in Table 3.2 - Recommended Actions.

Table 3.2: Recommended Actions

Humidifiers & Misters, Decorative Fountains & Water Features, Hot Tubs, Whirlpools & Spas	
No Action Required Non-Detectable (ND)	<ul style="list-style-type: none"> Continue routine monitoring for <i>Legionella</i> levels, as scheduled per the site-specific plan, based on risk assessment results. Continue maintaining system and source. Consider reassessment if conditions change to favor <i>Legionella</i> colonization or amplification.
1 <1 CFU/mL	<p>MONITOR -</p> <ol style="list-style-type: none"> Measure disinfectant levels, where appropriate, to determine if adequate to control <i>Legionella</i> growth; increase to effective control levels, if necessary. Measure temperature, where appropriate, to determine if it is within a range that is permissive for <i>Legionella</i> growth and adjust accordingly. Inspect system components for accumulated sediment, debris, scale, and biofilm. Ensure maintenance and operation procedures are appropriate and are being followed. Reassess treatment practices and consider cleaning and/or disinfection protocols if judged to be

Humidifiers & Misters, Decorative Fountains & Water Features, Hot Tubs, Whirlpools & Spas	
	necessary. 6. Collect retest samples if any changes to the operation of the system or cleaning or disinfection actions were taken; if re-testing, wait for at least 48hours, and no more than 7 days, after treatment.
<u>2</u> 1 to <10 CFU/mL	<p>INVESTIGATE & MITIGATE RISKS OF GROWTH - Take the water system component out of service as soon as possible.</p> <ol style="list-style-type: none"> 1. Implement Items 1-4 listed in Action 1 above. 2. Conduct remedial cleaning and/or disinfection protocols. 3. Reestablish normal biocide and pH levels. 4. Collect post-treatment samples. (Wait at least 48 hours, and no more than 7 days, after treatment to re-test.) 5. Based on professional judgment and the history of the water source, consider increasing the frequency and/or intensity of sampling efforts in order to identify any contributing amplification sources(s). 6. Wait until post-treatment sample results are reported and reviewed by a Competent Professional before returning the system to operation. <p><u>If one or more cases of legionellosis (either LP or PF) are suspected, take the following additional steps:</u></p> <ul style="list-style-type: none"> • Notify appropriate management and public health authorities (if required) of test results and coordinate further efforts. • Coordinate and implement cleaning and/or disinfection protocols with any proposed testing by public health officials, when applicable.
<u>3</u> >10 CFU/mL	<p>INVESTIGATE, MITIGATE RISKS OF GROWTH & REMEDIATE GROWTH - IMMEDIATELY take the water system component out of service.</p> <ul style="list-style-type: none"> • Implement Items 1-5 listed in Action 2 above. • Wait until post-treatment sample results are reported and reviewed by a Competent Professional before returning the system to operation. <p><u>If one or more cases of legionellosis (either LP or PF) are suspected, take the following additional steps:</u></p> <ul style="list-style-type: none"> • Notify appropriate management and public health authorities (if required) of test results and coordinate further efforts. • Coordinate and implement cleaning and/or disinfection protocols with any proposed testing by public health officials, when applicable.

Incoming Municipal Water	
No Action Required None Detectable (ND)	<ul style="list-style-type: none"> • Continue routine monitoring for <i>Legionella</i> levels, as scheduled per the site-specific plan, based on risk assessment results. • Continue maintaining system and source. • Consider reassessment if conditions change to favor <i>Legionella</i> colonization or amplification.
<u>4</u> < 1 CFU/mL	<p>MONITOR-</p> <ol style="list-style-type: none"> 1. Measure and document incoming water disinfectant levels and pH at least three times a week (for 1-2 weeks).
<u>5</u> 1 to <10 CFU/mL	<p>INVESTIGATE & MITIGATE RISKS OF GROWTH -</p> <ol style="list-style-type: none"> 1. Measure and document incoming water temperature, disinfectant levels, and pH every other day (for 1-2 weeks). 2. Investigate possible causes of water supply disruption or disturbance, such as water main or service line breaks, and/or nearby construction that maybe dislodging deposited sediment, debris,

Incoming Municipal Water	
	<p>or corrosion.</p> <ol style="list-style-type: none"> 3. Notify municipal water supplier of findings and request investigation of contributing factors. If low disinfectant levels are determined to be an issue, implement measures to increase them. 4. Based on professional judgment and the history of the water source, consider increasing the frequency and/or scope of sampling efforts IN THE PREMISE PLUMBING in order to identify high-risk sites of amplification source, such as water heaters or low use areas. 5. If disinfectant levels are increased, re-test the incoming water for culturable <i>Legionella</i> after 1-2 months.
<p><u>6</u></p> <p>>10 CFU/mL</p>	<p>INVESTIGATE, MITIGATE RISKS OF GROWTH & ENHANCE CONTROL MEASURES -</p> <ol style="list-style-type: none"> 1. Measure and document incoming water disinfectant levels and pH every other day (for 1-2 weeks). 2. Notify the municipal water supplier of these findings and request investigation of contributing factors. If low disinfectant levels are determined to be an issue, consider adding supplemental disinfectant. 3. IMMEDIATELY examine secondary parameters (pH, residual disinfectant levels, water temperature, etc.) in the premise plumbing to identify potential effects of elevated <i>Legionella</i> levels in municipal water supply. 4. Carry out a complete <i>Legionella</i> site assessment for at-risk premise plumbing and other building water systems that receive water from this service. Take appropriate actions based on the findings of the building water systems assessment. 5. Based on professional judgment and the history of the water source, consider increasing the frequency and/or scope of sampling efforts IN THE PREMISE PLUMBING in order to identify high-risk sites of amplification source, such as water heaters or low use areas. 6. Re-test the incoming water for culturable <i>Legionella</i> after 1 month.
Premise Plumbing Potable Water	
<p>No Action Required</p> <p><1 CFU/mL</p>	<ul style="list-style-type: none"> • Continue routine monitoring for <i>Legionella</i> levels, as scheduled per the site-specific plan, based on risk assessment results. • Continue maintaining system and source. • Consider reassessment if conditions change to favor <i>Legionella</i> colonization or amplification.
<p><u>7</u></p> <p>1 to <10 CFU/mL</p>	<p>MONITOR-</p> <ol style="list-style-type: none"> 1. Measure disinfectant levels (and pH if necessary) to determine if adequate to control <i>Legionella</i> growth. 2. Measure water temperatures to determine if they are within a range that is permissive for <i>Legionella</i> growth and adjust accordingly. 3. Reassess maintenance, usage patterns, and flushing programs; if existing procedures need improvement or if none exist, implement actions (such as periodic flushing) to improve disinfectant levels and/or alter temperatures to inhibit <i>Legionella</i> growth.
<p><u>8</u></p> <p>10 to <100 CFU/m</p>	<p>INVESTIGATE & MITIGATE RISKS OF GROWTH -</p> <ol style="list-style-type: none"> 1. Implement Items 1-3 listed in Action 7 above. 2. If multiple sample sites for a water system (hot or cold) are positive for <i>Legionella</i> in this range, implement remedial cleaning or disinfection protocols, considering the following: <ul style="list-style-type: none"> • If disinfectants are low, perform flushing and/or consider adding supplemental disinfectant. • If needed (and possible), adjust temperatures to levels that can better control <i>Legionella</i> growth. • Based on professional judgment, history of the water source, and the sampling data: <ul style="list-style-type: none"> - If the sample results from other locations in the water system indicate systemic growth, implement systemwide remedial cleaning or disinfection protocols, or - If the sample results indicate localized or distal growth, implement localized remedial cleaning, disinfection protocols, or fixture replacement. 3. Re-test the entire water system for culturable <i>Legionella</i> at least 48 hours, and no more than 7

Premise Plumbing Potable Water	
	<p>days, after disinfection to assess the effectiveness of corrective actions.</p> <p>4. Consider increasing the frequency and/or intensity of sampling efforts in order to identify any contributing amplification source(s) or implement preventive cleaning or biocide treatment.</p> <p>5. Implement follow-up monitoring using a Routine Evaluation strategy.</p> <p><u>If one or more cases of legionellosis (either LP or PF) are suspected, take the following additional steps:</u></p> <p>6. Notify appropriate management and public health authorities (if required) of test results and coordinate further efforts.</p> <p>7. Take immediate steps to prevent further aerosol exposure to occupants, workers, and the public. Interim measures to restrict water use, filter the organism from the water, or prevent aerosolization can effectively prevent exposure until terminal measures are implemented.</p> <p>8. Coordinate and implement remedial cleaning and/or disinfection protocols with any proposed testing by public health officials.</p> <p>9. Continue water use restrictions and/or interim measures until post-treatment sample results are received from the laboratory and reviewed by a Competent Professional.</p> <p>All amplification sites identified in the course of further investigation should be remediated and actions taken to monitor for and prevent its reoccurrence. Perform post-remediation testing to verify and document the effectiveness of remediation protocols.</p>

Cooling Towers and Evaporative Condensers	
<p>No Action Required</p> <p><10 CFU/mL</p>	<p>MONITOR-</p> <ul style="list-style-type: none"> • Verify water treatment procedures and, if necessary, increase biocide treatment levels. Review physical cleaning, biocide, corrosion, and scale control program to determine if it should be enhanced. Continue maintaining system. • Control room monitoring for <i>Legionella</i> levels, as scheduled per the site-specific plan, based on risk assessment results. • Consider <i>any</i> state local statutes requiring specific sampling intervals.
<p>10</p> <p>10 to <100 CFU/mL</p>	<p>ON-LINE DISINFECTION -</p> <p>1. Perform <i>On-line Disinfection within 24 hours</i>, per recommendations described in the Cooling Technology Institute <i>Legionellosis Guideline: Practices to Reduce the Risk of legionellosis from Evaporative Heat Rejection Equipment Systems</i> [GDL159] (2021).</p> <p>Perform post-treatment testing to verify and document the effectiveness of remediation protocols and implement follow-up monitoring using a Routine Evaluation strategy as follows:</p> <p>2. After 3-7days, re-test cooling tower for culturable <i>Legionella</i> levels.</p> <p>3. Retreat and test until <i>Legionella</i> levels are consistently below 10 CFU/mL.</p> <p>4. If online disinfection is considered ineffective by a Competent Professional, shut down and clean the cooling tower within 7 days.</p> <p>5. Review physical cleaning, biocide, corrosion, and scale control program to determine if it should be enhanced moving forward.</p> <p>6. Implement follow-up monitoring.</p> <p>Some state and local statutes may require specific sampling intervals, remedial actions, and reporting requirements.</p>
<p>11</p> <p>100 to</p>	<p>EMERGENCY DISINFECTION-</p> <p>1. Perform <i>On-line Disinfection within 24 hours</i>, per recommendations described in the Cooling Technology Institute <i>Legionellosis Guideline: Practices to Reduce the Risk of legionellosis from Evaporative Heat Rejection Equipment Systems</i> [GDL159] (2021).</p>

Cooling Towers and Evaporative Condensers	
<p><1000 CFU/mL</p>	<p>Perform post-treatment testing to verify and document the effectiveness of remediation protocols and implement follow-up monitoring using a Routine Evaluation strategy as follows:</p> <ol style="list-style-type: none"> 2. After 3-7days, re-test cooling tower for culturable Legionella levels. 3. Retreat and test until Legionella levels are consistently below 10 CFU/mL. 4. If online disinfection is considered ineffective by a Competent Professional, shut down and clean the cooling tower within 7 days. 5. Review physical cleaning, biocide, corrosion, and scale control program to determine if it should be enhanced moving forward. 6. Implement follow-up monitoring. <p>Some state and local statutes may require specific sampling intervals, remedial actions, and reporting requirements.</p> <p><u>If one or more cases of legionellosis (either LP or PF) are suspected, take the following additional steps:</u></p> <ul style="list-style-type: none"> • Notify appropriate management and public health authorities (if required) of test results and coordinate further efforts. • Coordinate and implement remedial cleaning and/or disinfection protocols with any proposed testing by public health officials.
<p>12</p> <p>>1000 CFU/mL</p>	<p>EMERGENCY DISINFECTION & CLEANING-</p> <ul style="list-style-type: none"> • Perform <i>On-line Disinfection within 24 hours</i>, per recommendations described in the Cooling Technology Institute <i>Legionellosis Guideline: Practices to Reduce the Risk of legionellosis from Evaporative Heat Rejection Equipment Systems</i> [GDL159] (2021) • Follow up with a shutdown and cleaning of the cooling tower within 2 days. <p>Perform post-treatment testing to verify and document the effectiveness of remediation protocols and implement follow-up monitoring using a Routine Evaluation strategy as follows:</p> <ol style="list-style-type: none"> 1. After 3-7 days, re-test cooling tower for culturable <i>Legionella</i> levels. 2. Retreat and test until <i>Legionella</i> levels are consistently below 10 CFU/mL. 3. If online disinfection is considered ineffective by a Competent Professional, shut down and clean the cooling tower within 7 days. 4. Review physical cleaning, biocide, corrosion, and scale control program to determine if it should be enhanced moving forward. 5. Implement follow-up monitoring. <p>Some state and local statutes may require specific sampling intervals, remedial actions, and reporting requirements.</p> <p><u>If one or more cases of legionellosis (either LP or PF) are suspected, take the following additional steps:</u></p> <ul style="list-style-type: none"> • Notify appropriate management and public health authorities (if required) of test results and coordinate further efforts. • Coordinate and implement remedial cleaning and/or disinfection protocols with any proposed testing by public health officials.

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